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Title: METHOD FOR PRODUCING POLYURETHANE

Designation: METHOD FOR PRODUCING POLYURETHANE

Abstract

A method for producing polyurethane pre-polymers and foamed plastics, using natural soya oil. Soya oil forms OH groups in the presence of a polyol in a pre-polymerization process. Said OH groups react to the NCO groups of an isocyanate.

Summary

Natural soya oil is being used to produce polyurethane pre-polymers and foamed plastics. It was determined that - in the presence of a polyol - soya oil forms OH groups which react to the NCO groups of the isocyanate.

Method for the Production of Polyurethane

The invention refers to a method for the production of polyurethane, including polyurethane pre-polymers. It also concerns the utilization of the polyurethane that is produced as per the invention, f.i. pre-polymers.

It is also known that castor oil, i.e. a natural raw material, can be converted to polyurethane with polyisocyanate. Castor oil consists of 80-85 per cent by weight of ricinoleid acid glyceride, that is to say of a trihydric alcohol (triol) with approximately 5.2% of reactive OH groups. However, due to the high OH value, the conversion of castor oil requires a large amount of polyisocyanate, which results in high production costs.

In the Portuguese patent 86.688, the inventor already proposed vegetable oils without OH groups as being particularly suitable plasticizing agents in pre-polymers. In view of the soya oil epoxide, the recovery (isolation) of polyols (polyhydric alcohols) through partially opening the ethylene oxide ring (oxiran) with alcohol, forms part of the (prior) state of the art.

The endeavor of the invention is to lower the costs of polyurethane production.

This is achieved, as per the invention, due to the fact that the conversion of the polyisocyanate with a polyol, such as castor oil, is carried out in the presence of soya oil.

Mixtures of polyols, in particular castor oil plus soya oil, are cost-advantageous, and less viscous when mixed with polyisocyanates.

At first glance, it seems that soya oil actually does the job of a plasticizing agent, but - subsequent to the reaction of the excess polyisocyanate with other OH groups, a solid bond of the soya oil occurs.

As per the invention, it was determined/ established, that natural castor oil turns into (is converted into) a polyol during the manufacture of polyurethane pre-polymers and polyurethane foamed plastics. This means, that during the pre-polymerization process and with a polyol present, the natural soya oil creates OH groups that react to the NCO groups of the polyisocyanate.

Thus, it was established that when a mixture of castor oil and soya oil is mixed with a corresponding quantity of polyisocyanate - after pre-polymerization in contact with air humidity - this mixture becomes fully cured; this means that the soya oil - which initially/ originally did not react to isocyanates - has been converted into a polyol during the reaction of the excess isocyanate.

It is preferred that di-isocyanates be used as polyisocyanate, f.i. 4.4'-methylene di-(phenylisocyanate). As per the invention, triols in particular are used as polyols, preferably castor oil.

Preferably, the castor oil is used at a weight ratio of soya oil to castor oil that ranges from 0.2 to 5 parts, in particular 0.5 to 2; a specially preferred ratio to be used is about one part per part by weight of castor oil.

Relative to the polyol, the soya oil being employed should preferably be in the amount of 10g to 300g, in particular 70g to 200g per OH molecular equivalent of the polyol. In this case, an OH molecular equivalent means the molecular weight of the polyol divided by its (reactive) OH groups.

The molecular ratio of the polyisocyanate's NCO groups to the polyisocyanate's HO groups is preferably 1 to 4 :1, in particular 2 to 3 : 1.

Preferably, when the polyisocyanate is converted with the polyol and soya oil, it is first converted to a pre-polymer with free isocyanate groups. For this purpose - at the reaction to the polyol and the soya oil - the polyisocyanate is fed in at a stoichiometric excess, which is calculated in such a way that from 3% to 30%, and in particular about 10% of the NCO groups are not converted.

The pre-polymer that is thus obtained, can be cured (final curing) - by adding compounds with acid OH groups, in particular water - by converting the excess of the free isocyanate groups. Known catalysts, f.i. dibutyl tin dilaurate (DBTL) may also be used for the production of polyurethane.

Example 1

100g castor oil and 100g soya oil are mixed. Stirring constantly, the mixture is heated to approx. 150°C, and maintained at this temperature for about 30 minutes. After letting it cool down to approx. 70°C while stirring it constantly and by exclusion of water - about 200 g MDI (Bayer product "44V20") are added, and the entire mixture is kept at approx. 90°C during 1 hour. The pre-polymer that is obtained in this manner will be cured by atmospheric moisture and will become an extremely resistent film (skin).

Example 2

100g of the pre-polymer produced as per Example 1, are mixed with 5 g of water and 0.3 DBTL. A rigid foam with good strength and chemical characteristics is obtained after the exothermic reaction.

Patent Claims

1. Method for the production of polyurethane, where a polyisocyanate is converted with a polyol, THEREBY IDENTIFIED that the conversion of the polyisocyanate with the polyol is carried out in the presence of soya oil.

2. Method as per Claim 1, THEREBY IDENTIFIED that the soya oil is employed in the amount of 10 g to 300 g, relative to an OH molecular equivalent of the polyol.

3. Method as per Claim 1 or 2, THEREBY IDENTIFIED that the molecular ratio of the polyisocyanate's NCO groups to the OH groups of the polyol is 1 to 4 : 1.

4. Method as per one of the preceding Claims, THEREBY IDENTIFIED that castor oil is being utilized as polyol.

5. Method as per Claim 1, THEREBY IDENTIFIED that in order to create a polymer with free isocyanate groups, the polyisocyanate is employed in excess during the conversion with the polyol and the soya oil.

6. Method as per Claim 5, THEREBY IDENTIFIED that the polymer is converted with a compound that contains acid hydrogen.

7. Polyurethane, produced as per one of the preceding Claims, to be used for the production of polyurethane foamed plastic.

8. Utilization, as per Claim 7, THEREBY IDENTIFIED that the pre-polymer as per Claim 6 is employed for the production of the polyurethane foamed plastic.